C L A I M S

1. A radio communication system characterized by comprising a radio transmitter and a radio receiver,

said radio transmitter including encoding means for encoding a digital signal to be transmitted, and a transmission antenna which transmits the signal encoded by said encoding means, and

said radio receiver including a reception antenna which receives the transmitted signal, and decoding means for performing decoding corresponding to encoding for the signal received by said reception antenna and restoring the digital signal,

wherein communication is performed without using any carrier.

2. A radio communication system according to claim 1, characterized in that said encoding means encodes the digital signal to be transmitted by using a code not containing any DC component.

3. A radio communication system according to claim 1, characterized in that

said encoding means comprises spreading means for performing a spread spectrum process by multiplying the digital signal to be transmitted by a spreading code and outputting the spread signal to said transmission antenna, and

said decoding means comprises despreading means for performing despreading corresponding to the

spread spectrum process for the signal received by said reception antenna and restoring the digital signal.

4. A radio communication system according to claim 3, characterized in that the spreading code does not contain any DC component.

5. A radio communication system according to claim 1, characterized in that

said encoding means comprises spreading means for performing a spread spectrum process by multiplying the digital signal to be transmitted by a spreading code, and signal generation means for generating an impulse signal in response to rise and fall of a signal spread by said spreading means and outputting the impulse signal to said transmission antenna, and

said decoding means comprises despreading means for performing despreading corresponding to the spread spectrum process for the signal received by said reception antenna, and peak detection means for detecting a peak of the signal despread by said despreading means and restoring the digital signal.

6. A radio communication system according to claim 1, characterized in that

said encoding means comprises spreading means for performing a spread spectrum process by multiplying the digital signal to be transmitted by a spreading code, and signal generation means for generating an impulse signal in response to rise and fall of a signal spread

by said spreading means and outputting the impulse signal to said transmission antenna, and

said decoding means comprises signal regeneration means for regenerating the spread signal from the signal received by said reception antenna, and despreading means for performing despreading corresponding to the spread spectrum process for the spread signal output from said signal regeneration means and restoring the digital signal.

7. A radio communication system according to claim 1, characterized in that

said encoding means comprises spreading means for performing a spread spectrum process by multiplying the digital signal to be transmitted by a spreading code, and signal generation means for generating an impulse signal in response to rise and fall of a signal spread by said spreading means and outputting the impulse signal to said transmission antenna, and

said decoding means comprises signal regeneration means for regenerating the spread signal from the signal received by said reception antenna, despreading means for performing despreading corresponding to the spread spectrum process for the spread signal output from said signal regeneration means, and peak detection means for detecting a peak of the signal despread by said despreading means and restoring the digital signal.

8. A radio communication system according to claim 1, characterized in that

said encoding means comprises spreading means for performing a spread spectrum process by multiplying the digital signal to be transmitted by a spreading code, and signal generation means for generating an impulse signal in response to rise and fall of a signal spread by said spreading means and outputting the impulse signal to said transmission antenna, and

said decoding means comprises despreading means for performing despreading corresponding to the spread spectrum process for the signal received by said reception antenna, integrating means for integrating the signal despread by said despreading means, and peak detection means for detecting a peak of the signal output from said integrating means and restoring the digital signal.

9. A radio communication system according to claim 1, characterized in that

said encoding means comprises spreading means for performing a spread spectrum process by multiplying the digital signal to be transmitted by a spreading code, and signal generation means for generating an impulse signal in response to rise and fall of a signal spread by said spreading means and outputting the impulse signal to said transmission antenna, and

said decoding means comprises despreading

means for performing despreading for the signal received by said reception antenna by using a spreading code corresponding to a differentiated spread signal, and peak detection means for detecting a peak of the signal despread by said despreading means and restoring the digital signal.

10. A radio communication system according to claim 9, characterized in that letting ΔS be the differentiated spread signal, C be a spreading code corresponding to the spread signal ΔS, P be a correlation value between the spread signal ΔS and the spreading code C, and M be a code length of the spreading code C,

$$P \approx \sum_{k=1}^{M}\left(\Delta S_k \cdot \sum_{r=k}^{M} C_r\right)$$

is established.

11. A radio communication system according to claim 5, characterized in that said signal generation means outputs only an impulse signal in an nth (n is an integer of not less than 2) harmonic band at a spread chip rate.

12. A radio communication system according to claim 6, characterized in that said signal generation means outputs only an impulse signal in an nth (n is an integer of not less than 2) harmonic band at a spread chip rate.

13. A radio communication system according to

claim 7, characterized in that said signal generation means outputs only an impulse signal in an nth (n is an integer of not less than 2) harmonic band at a spread chip rate.

14. A radio communication system according to claim 8, characterized in that said signal generation means outputs only an impulse signal in an nth (n is an integer of not less than 2) harmonic band at a spread chip rate.

15. A radio communication system according to claim 9, characterized in that said signal generation means outputs only an impulse signal in an nth (n is an integer of not less than 2) harmonic band at a spread chip rate.

16. A radio transmitter characterized by comprising:

encoding means for encoding a digital signal to be transmitted; and

a transmission antenna which transmits the signal encoded by said encoding means,

wherein the digital signal is transmitted without using any carrier.

17. A radio transmitter according to claim 16, characterized in that said encoding means encodes the digital signal to be transmitted by using a code not containing any DC component.

18. A radio transmitter according to claim 16,

characterized in that said encoding means comprises spreading means for performing a spread spectrum process by multiplying the digital signal to be transmitted by a spreading code and outputting the spread signal to said transmission antenna.

19. A radio transmitter according to claim 18, characterized in that the spreading code does not contain any DC component.

20. A radio transmitter according to claim 16, characterized in that said encoding means comprises spreading means for performing a spread spectrum process by multiplying the digital signal to be transmitted by a spreading code, and signal generation means for generating an impulse signal in response to rise and fall of a signal spread by said spreading means and outputting the impulse signal to said transmission antenna.

21. A radio transmitter according to claim 20, characterized in that said signal generation means outputs only an impulse signal in an nth (n is an integer of not less than 2) harmonic band at a spread chip rate.

22. A radio receiver which receives a signal from a radio transmitter that encodes a digital signal to be transmitted and transmits the digital signal without using any carrier, characterized by comprising:

a reception antenna which receives the

transmitted signal; and

decoding means for performing decoding corresponding to encoding for the signal received by said reception antenna and restoring the digital signal.

23. A radio receiver according to claim 22, characterized in that said decoding means performs decoding corresponding to encoding using a code not containing any DC component.

24. A radio receiver according to claim 22, characterized in that

said radio receiver receives a signal from the radio transmitter which transmits, without using any carrier, a signal subjected to a spread spectrum process by multiplying the digital signal to be transmitted by a spreading code, and

said decoding means comprises despreading means for performing despreading corresponding to the spread spectrum process for the signal received by said reception antenna and restoring the digital signal.

25. A radio receiver according to claim 24, characterized in that the spreading code does not contain any DC component.

26. A radio receiver according to claim 22, characterized in that

said radio receiver receives a signal from the radio transmitter which generates an impulse signal in response to rise and fall of a spread signal obtained by

performing a spread spectrum process for the digital signal to be transmitted and transmits the impulse signal without using any carrier, and

said decoding means comprises despreading means for performing despreading corresponding to the spread spectrum process for the signal received by said reception antenna, and peak detection means for detecting a peak of the signal despread by said despreading means and restoring the digital signal.

27. A radio receiver according to claim 22, characterized in that

said radio receiver receives a signal from the radio transmitter which generates an impulse signal in response to rise and fall of a spread signal obtained by performing a spread spectrum process for the digital signal to be transmitted and transmits the impulse signal without using any carrier, and

said decoding means comprises signal regeneration means for regenerating the spread signal from the signal received by said reception antenna, and despreading means for performing despreading corresponding to the spread spectrum process for the spread signal output from said signal regeneration means and restoring the digital signal.

28. A radio receiver according to claim 22, characterized in that

said radio receiver receives a signal from the

radio transmitter which generates an impulse signal in response to rise and fall of a spread signal obtained by performing a spread spectrum process for the digital signal to be transmitted and transmits the impulse signal without using any carrier, and

said decoding means comprises signal regeneration means for regenerating the spread signal from the signal received by said reception antenna, despreading means for performing despreading corresponding to the spread spectrum process for the spread signal output from said signal regeneration means, and peak detection means for detecting a peak of the signal despread by said despreading means and restoring the digital signal.

29. A radio receiver according to claim 22, characterized in that

said radio receiver receives a signal from the radio transmitter which generates an impulse signal in response to rise and fall of a spread signal obtained by performing a spread spectrum process for the digital signal to be transmitted and transmits the impulse signal without using any carrier, and

said decoding means comprises despreading means for performing despreading corresponding to the spread spectrum process for the signal received by said reception antenna, integrating means for integrating the signal despread by said despreading means, and peak

detection means for detecting a peak of the signal output from said integrating means and restoring the digital signal.

30. A radio receiver according to claim 22, characterized in that

said radio receiver receives a signal from the radio transmitter which generates an impulse signal in response to rise and fall of a spread signal obtained by performing a spread spectrum process for the digital signal to be transmitted and transmits the impulse signal without using any carrier, and

said decoding means comprises despreading means for performing despreading for the signal received by said reception antenna by using a spreading code corresponding to a differentiated spread signal, and peak detection means for detecting a peak of the signal despread by said despreading means and restoring the digital signal.

31. A radio receiver according to claim 30, characterized in that letting ΔS be the differentiated spread signal, C be a spreading code corresponding to the spread signal ΔS, P be a correlation value between the spread signal ΔS and the spreading code C, and M be a code length of the spreading code C,

$$P \approx \sum_{k=1}^{M}\left(\Delta S_k \cdot \sum_{r=k}^{M} C_r\right)$$

is established.

32. A radio communication method characterized by comprising the encoding step of encoding a digital signal to be transmitted, the transmission step of transmitting the signal encoded in the encoding step, the reception step of receiving the transmitted signal, and the decoding step of performing decoding corresponding to encoding for the signal received in the reception step and restoring the digital signal, wherein communication is performed without using any carrier.

33. A radio communication method according to claim 32, characterized in that in the encoding step, the digital signal to be transmitted is encoded using a code not containing any DC component.

34. A radio communication method according to claim 32, characterized in that

the encoding step comprises the spreading step of performing a spread spectrum process by multiplying the digital signal to be transmitted by a spreading code, and

the decoding step comprises the despreading step of performing despreading corresponding to the spread spectrum process for the signal received in the reception step and restoring the digital signal.

35. A radio communication method according to claim 34, characterized in that the spreading code does not contain any DC component.

36. A radio communication method according to

claim 32, characterized in that

the encoding step comprises the spreading step of performing a spread spectrum process by multiplying the digital signal to be transmitted by a spreading code, and the signal generation step of generating an impulse signal in response to rise and fall of a signal spread in the spreading step, and

the decoding step comprises the despreading step of performing despreading corresponding to the spread spectrum process for the signal received in the reception step, and the peak detection step of detecting a peak of the signal despread in the despreading step and restoring the digital signal.

37. A radio communication method according to claim 32, characterized in that

the encoding step comprises the spreading step of performing a spread spectrum process by multiplying the digital signal to be transmitted by a spreading code, and the signal generation step of generating an impulse signal in response to rise and fall of a signal spread in the spreading step, and

the decoding step comprises the signal regeneration step of regenerating the spread signal from the signal received in the reception step, and the despreading step of performing despreading corresponding to the spread spectrum process for the spread signal output in the signal regeneration step and restoring the

digital signal.

38. A radio communication method according to claim 32, characterized in that

the encoding step comprises the spreading step of performing a spread spectrum process by multiplying the digital signal to be transmitted by a spreading code, and the signal generation step of generating an impulse signal in response to rise and fall of a signal spread in the spreading step, and

the decoding step comprises the signal regeneration step of regenerating the spread signal from the signal received in the reception step, the despreading step of performing despreading corresponding to the spread spectrum process for the spread signal output in the signal regeneration step, and the peak detection step of detecting a peak of the signal despread in the despreading step and restoring the digital signal.

39. A radio communication method according to claim 32, characterized in that

the encoding step comprises the spreading step of performing a spread spectrum process by multiplying the digital signal to be transmitted by a spreading code, and the signal generation step of generating an impulse signal in response to rise and fall of a signal spread in the spreading step, and

the decoding step comprises the despreading

step of performing despreading corresponding to the spread spectrum process for the signal received in the reception step, the integrating step of integrating the signal despread in the despreading step, and the peak detection step of detecting a peak of the signal output in the integrating step and restoring the digital signal.

40. A radio communication method according to claim 32, characterized in that

the encoding step comprises the spreading step of performing a spread spectrum process by multiplying the digital signal to be transmitted by a spreading code, and the signal generation step of generating an impulse signal in response to rise and fall of a signal spread in the spreading step, and

the decoding step comprises the despreading step of performing despreading for the signal received in the reception step by using a spreading code corresponding to a differentiated spread signal, and the peak detection step of detecting a peak of the signal despread in the despreading step and restoring the digital signal.

41. A radio communication method according to claim 40, characterized in that letting ΔS be the differentiated spread signal, C be a spreading code corresponding to the spread signal ΔS, P be a correlation value between the spread signal ΔS and the spreading code C, and M be a code length of the

spreading code C,

$$P \approx \sum_{k=1}^{M}\left(\Delta S_k \cdot \sum_{r=k}^{M} C_r\right)$$

is established.

42. A radio communication method according to claim 36, characterized in that in the signal generation step, only an impulse signal in an nth (n is an integer of not less than 2) harmonic band at a spread chip rate is output.

43. A radio communication method according to claim 37, characterized in that in the signal generation step, only an impulse signal in an nth (n is an integer of not less than 2) harmonic band at a spread chip rate is output.

44. A radio communication method according to claim 38, characterized in that in the signal generation step, only an impulse signal in an nth (n is an integer of not less than 2) harmonic band at a spread chip rate is output.

45. A radio communication method according to claim 39, characterized in that in the signal generation step, only an impulse signal in an nth (n is an integer of not less than 2) harmonic band at a spread chip rate is output.

46. A radio communication method according to claim 40, characterized in that in the signal generation step, only an impulse signal in an nth (n is an integer

of not less than 2) harmonic band at a spread chip rate is output.

47. A radio transmission method characterized by comprising:

the encoding step of encoding a digital signal to be transmitted; and

the transmission step of transmitting the encoded signal,

wherein the digital signal is transmitted without using any carrier.

48. A radio transmission method according to claim 47, characterized in that in the encoding step, the digital signal to be transmitted is encoded by using a code not containing any DC component.

49. A radio transmission method according to claim 47, characterized in that the encoding step comprises the spreading step of performing a spread spectrum process by multiplying the digital signal to be transmitted by a spreading code and outputting the spectrum-spread signal to the transmission antenna.

50. A radio transmission method according to claim 49, characterized in that the spreading code does not contain any DC component.

51. A radio transmission method according to claim 47, characterized in that the encoding step comprises the spreading step of performing a spread spectrum process by multiplying the digital signal to be

transmitted by a spreading code, and the signal generation step of generating an impulse signal in response to rise and fall of a spread signal spectrum-spread in the spreading step.

52. A radio transmission method according to claim 51, characterized in that in the signal generation step, only an impulse signal in an nth (n is an integer of not less than 2) harmonic band at a spread chip rate is output.

53. A radio reception method of receiving a signal from a transmitting side which encodes a digital signal to be transmitted and transmits the digital signal without using any carrier, characterized by comprising:

the reception step of receiving the transmitted signal; and

the decoding step of performing decoding corresponding to encoding for the signal received in the reception step and restoring the digital signal.

54. A radio reception method according to claim 53, characterized in that in the decoding step, decoding corresponding to encoding using a code not containing any DC component is performed.

55. A radio reception method according to claim 53, characterized in that

a receiving side receives a signal from the transmitting side which transmits, without using any

carrier, a signal obtained subjected to a spread spectrum process by multiplying the digital signal to be transmitted by a spreading code, and

the decoding step comprises the despreading step of performing despreading corresponding to a spread spectrum process for the signal received in the reception step and restoring the digital signal.

56. A radio reception method according to claim 55, characterized in that the spreading code does not contain any DC component.

57. A radio reception method according to claim 53, characterized in that

a receiving side receives a signal from the transmitting side which generates an impulse signal in response to rise and fall of a spread signal obtained by performing a spread spectrum process for the digital signal to be transmitted and transmits the impulse signal without using any carrier, and

the decoding step comprises the despreading step of performing despreading corresponding to the spread spectrum process for the signal received in the reception step, and the peak detection step of detecting a peak of the despread signal and restoring the digital signal.

58. A radio reception method according to claim 53, characterized in that

a receiving side receives a signal from the

transmitting side which generates an impulse signal in response to rise and fall of a spread signal obtained by performing a spread spectrum process for the digital signal to be transmitted and transmits the impulse signal without using any carrier, and

the decoding step comprises the signal regeneration step of regenerating the spread signal from the signal received in the reception step, and the despreading step of performing despreading corresponding to the spread spectrum process for the regenerated spread signal and restoring the digital signal.

59. A radio reception method according to claim 53, characterized in that

a receiving side receives a signal from the transmitting side which generates an impulse signal in response to rise and fall of a spread signal obtained by performing a spread spectrum process for the digital signal to be transmitted and transmits the impulse signal without using any carrier, and

the decoding step comprises the signal regeneration step of regenerating the spread signal from the signal received in the reception step, the despreading step of performing despreading corresponding to the spread spectrum process for the regenerated spread signal, and the peak detection step of detecting a peak of the despread signal and restoring the digital signal.

60. A radio reception method according to claim 53, characterized in that

a receiving side receives a signal from the transmitting side which generates an impulse signal in response to rise and fall of a spread signal obtained by performing a spread spectrum process for the digital signal to be transmitted and transmits the impulse signal without using any carrier, and

the decoding step comprises the despreading step of performing despreading corresponding to the spread spectrum process for the signal received in the reception step, the integrating step of integrating the despread signal, and the peak detection step of detecting a peak of the integrated signal and restoring the digital signal.

61. A radio reception method according to claim 53, characterized in that

a receiving side receives a signal from the transmitting side which generates an impulse signal in response to rise and fall of a spread signal obtained by performing a spread spectrum process for the digital signal to be transmitted and transmits the impulse signal without using any carrier, and

the decoding step comprises the despreading step of performing despreading for the signal received in the reception step by using a spreading code corresponding to a differentiated spread signal, and the

peak detection step of detecting a peak of the despread signal and restoring the digital signal.

62. A radio reception method according to claim 61, characterized in that letting ΔS be the differentiated spread signal, C be a spreading code corresponding to the spread signal ΔS, P be a correlation value between the spread signal ΔS and the spreading code C, and M be a code length of the spreading code C,

$$P \approx \sum_{k=1}^{M}\left(\Delta S_k \cdot \sum_{r=k}^{M} C_r\right)$$

is established.